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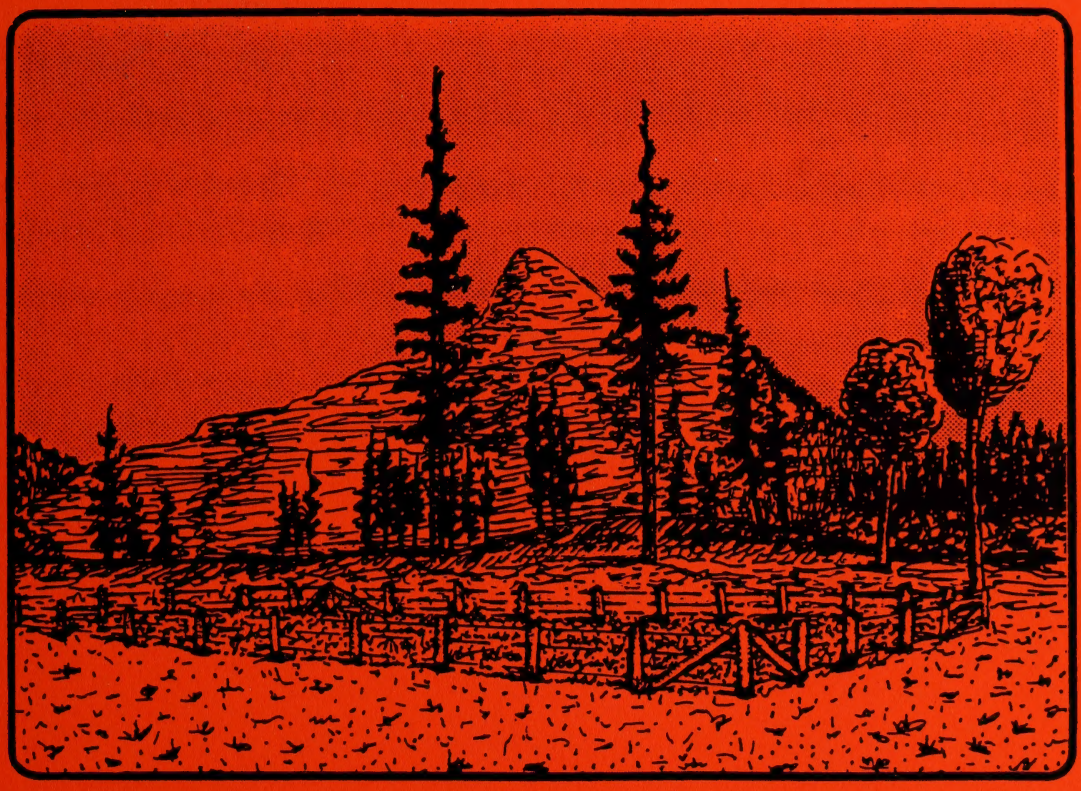
RANGELAND REFERENCE AREAS

SEVEN MILE CREEK
RANGE CONDITION AND TREND FROM 1964-1997



Alberta
ENVIRONMENTAL PROTECTION

RANGELAND REFERENCE AREAS

SEVEN MILE CREEK

RANGE CONDITION AND TREND FROM 1964-1997

prepared by

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Edmonton
1998

Environmental Protection
Land and Forest Service

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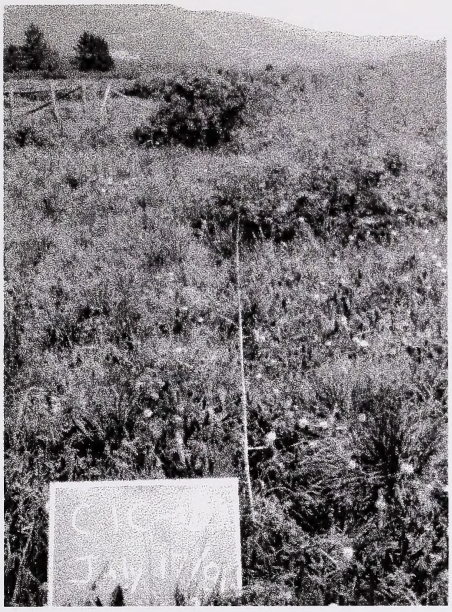
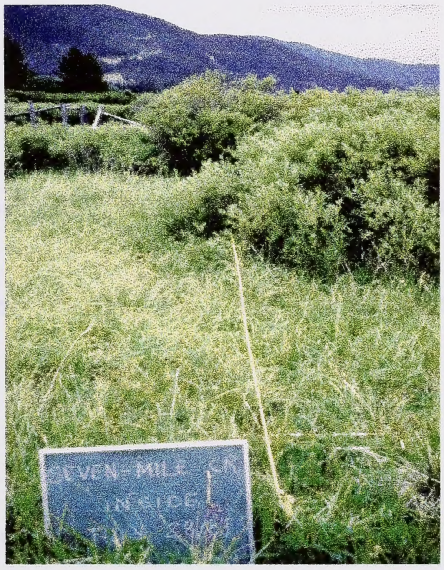
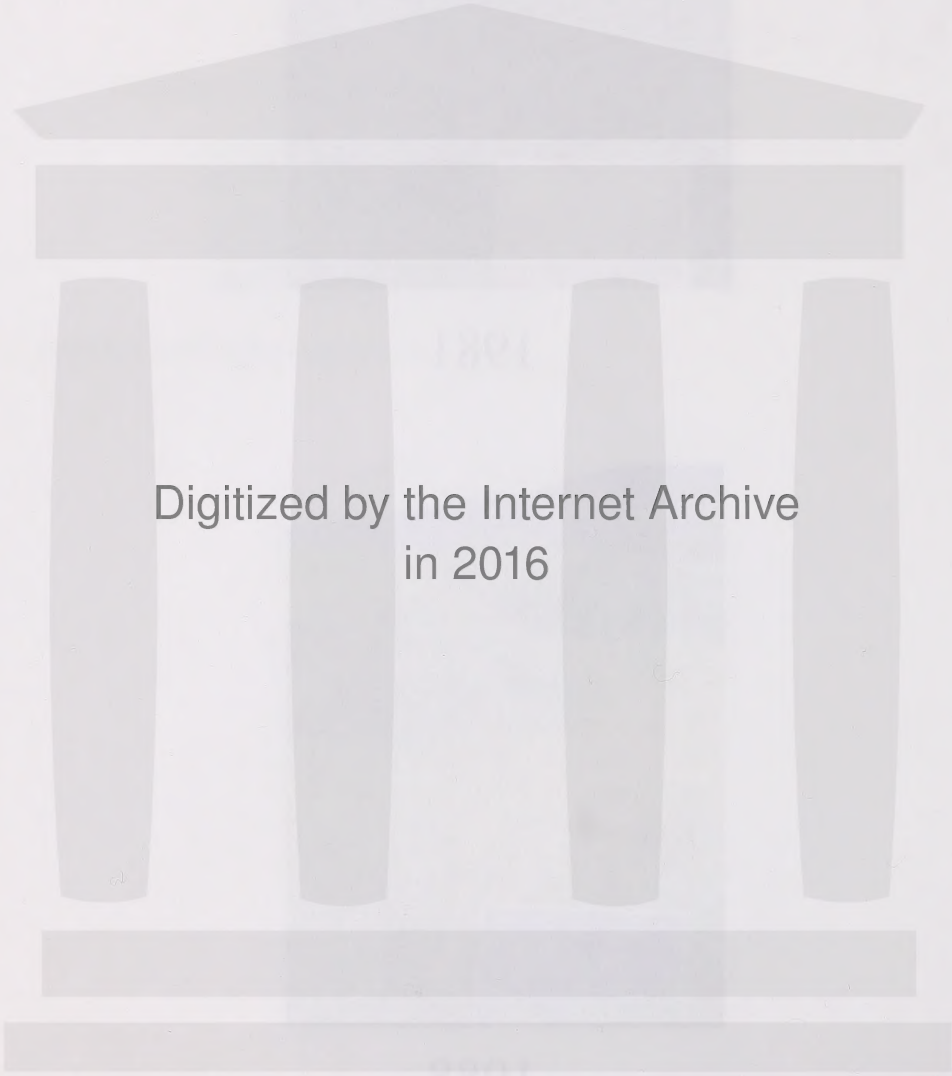


1981



1988

Photo 1. Shrub cover had noticeably increased on the inside transect at the Seven Mile Creek rangeland reference area from 1981 to 1988.



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ABSTRACT

The Rangeland Reference Area program administered by the Land and Forest Service was established by the Eastern Rockies Forest Conservation Board to assess range condition and monitor trend on rangelands within the boundaries of the Rocky Mountain Forest Reserve (RMFR). Forty-five fenced exclosures have been established in the Forest Reserve. These exclosures include permanently marked grazed and ungrazed transects. Species composition data has been recorded on these transects since 1953 when many of the sites were established. Recently, the data of these sites has been analyzed in order to determine the successional pathways in the presence and absence of grazing. This long-term data used in conjunction with a detailed ecological classification of the range community types will help to determine the health of the forested rangelands in the province.

This report evaluates and discusses the range condition and trend of the Seven Mile Creek Rangeland Reference Area. This reference area was established in 1964 on a glacial lacustrine veneer over glacio-fluvial gravel adjacent to Seven Mile creek in the Clearwater grazing allotment. The site is located within the Upper Foothills subregion and is part of the group of community types represented by the meadow ecosite (Willoughby and Smith 1997, Beckingham et al. 1996).

INTRODUCTION

In the late 1800's livestock grazing was unregulated along the eastern slopes of the Rocky Mountains in Alberta. In 1910 the Rocky Mountain Forest Reserve was established to protect the Saskatchewan River basin watershed. At this time grazing by domestic animals was prohibited. However, by 1913 grazing by livestock was recoqnized as a useful tool to reduce forage accumulation and assist in preventing a potential fire hazard. Due to inadequate management policies and funding, water quality continued to deterioate because of fire and localized overgrazing. As a result, the Rangeland Reference Area Program of the Alberta Forest Service was established in 1949 to assess range condition and monitor range trend on grasslands within the boundaries of the Rocky Mountain Forest Reserve (Hanson 1975). Fourty-five reference areas have been established in the Reserve. Many of these sites have been monitored since 1953.

This report discusses and evaluates the range condition and trend of the Seven Mile Creek Rangeland Reference Area. The reference area was established in 1964 in an area that was considered to be prime elk winter range and thought to be in poor condition.

SITE DESCRIPTION

The Seven Mile Reference Area is part of the primary rangelands in the Upper Foothills subregion of Alberta (Dept. of Environmental Protection 1994). This subregion extends from north of the Bow River into the Grande Cache area. The topography of the area consists of both mountains and foothills. Closed-canopy coniferous forest dominates this subregion. The potential climax species on modal sites are white (*Picea glauca*) and black (*Picea mariana*) spruce, with lodgepole pine (*Pinus contorta*) as an early successional species. The grassland/shrubland plant communities follow the creek and rivers throughout the foothills of the Rocky Mountains. These plant communities have a predominant willow (*Salix spp.*) and bog birch (*Betula glandulosa*) cover with pockets of open grassland. Willoughby and Smith (1997), classified the 1991 inside ungrazed transect at the reference area as a Willow/Sedge-Slender wheatgrass community type and the 1991 outside grazed transect as a Tufted hairgrass-Kentucky bluegrass community type[1]. These types are part of a complex of grazed and ungrazed native grass and shrublands that occur throughout the Upper foothills subregion. The reference area represents moist lowland sites that are slightly upslope from pure sedge (*Carex spp.*) meadows with a Orthic Humic Regosol soil (Weerstra 1989). These community types intergrade into drier rough fescue (*Festuca scabrella*) dominated grass and shrublands. On more mesic sites lodgepole pine forests predominate.

---

[1]In 1991 Kentucky bluegrass cover was 10%. Since 1991 Kentucky bluegrass cover has declined and the outside grazed transect would now be classified as a Tufted hairgrass-Sedge-Slender wheatgrass community type.

METHODS

Reference sites were selected from within range allotments on areas that represented primary range. Originally sites thought to be in poor range condition were selected. These sites were usually represented by open grasslands on south-facing slopes, benchlands and terraces. The reference sites were not located near salt or within 100-ft. (30-m) of a fence. The preferred distance from a water source was greater than 1000-ft. (300-m) but less than 1-mi. (1.6-km).

Each reference site consisted of a fenced exclosure and a 100-ft (33-m) transect inside and outside the exclosure. The outside transect was situated 25-ft (8-m) or greater from the edge of the exclosure. At 3-in. (7-cm) intervals, the basal frequency of the plant species were recorded using Parker's loop (Parker 1954). In 1982, the canopy cover of the plant species was also recorded (at 6-ft. (1.8-m) intervals) using a 20x50 cm Daubenmire frame. Presently, the transects are being recorded every three years. All the basal frequency data prior to 1982 was converted to canopy cover using regression analysis. The regression equation for the Seven Mile Reference Area was COVER=1.99 + 1.24 (FREQUENCY), R^2=.48, $p>0.05$.

A combination of of both ordination (DECORANA) (Gauch 1982) and cluster analysis (SAS) were used to group the inside and outside transects of different years. These techniques combined the sites based on the similarity of species composition. The groupings from cluster analysis were overlain on the site ordination. The number refers to the year the transect was recorded, the (i) refers to inside (ungrazed) and the (o) to the outside (grazed).

Mean grazing pressure for each year was assessed by comparing annual utilization to the rated carrying capacity of the lease. Total yearly AUM (Animal Unit Months) useage from the inception of the lease was divided by the calculated carrying capacity (AUM) and multiplied by 100. The utilization numbers for each year were averaged for each lease and applied to the sampled stands. For example a number of 100 would indicate proper utilization.

RESULTS

Vegetation

The ordination of the Seven Mile Rangeland Reference Area with years grouped by cluster analysis is outlined in Figure 1. The first two axes in the ordination account for 37% and 10% of the variation in the species stand table, respectively. There is a distinct grouping of the transects inside the exclosure from 1981 to 1997 (Group 2) and outside the exclosure from 1964 to 1997 (Group 1). The inside transects prior to 1981 were mathematically more similar to the outside transects and were placed in Group 1.

The inside transect from 1981-1997 represents a plant community that has been protected from grazing for more than 25 years. This community type is dominated by willow, veiny meadow rue, tall lungwort, sedge and slender wheatgrass and represents a Willow/Sedge-Slender wheatgrass dominated community type (Table 1). In contrast the outside grazed transects are dominated by tufted hairgrass, slender wheatgrass, sedge, yarrow and dandelion and represent a Tufted hairgrass-Sedge-Slender wheatgrass dominated community type (Table 1).

Table 2 outlines the change in canopy cover of selected species on the inside and outside

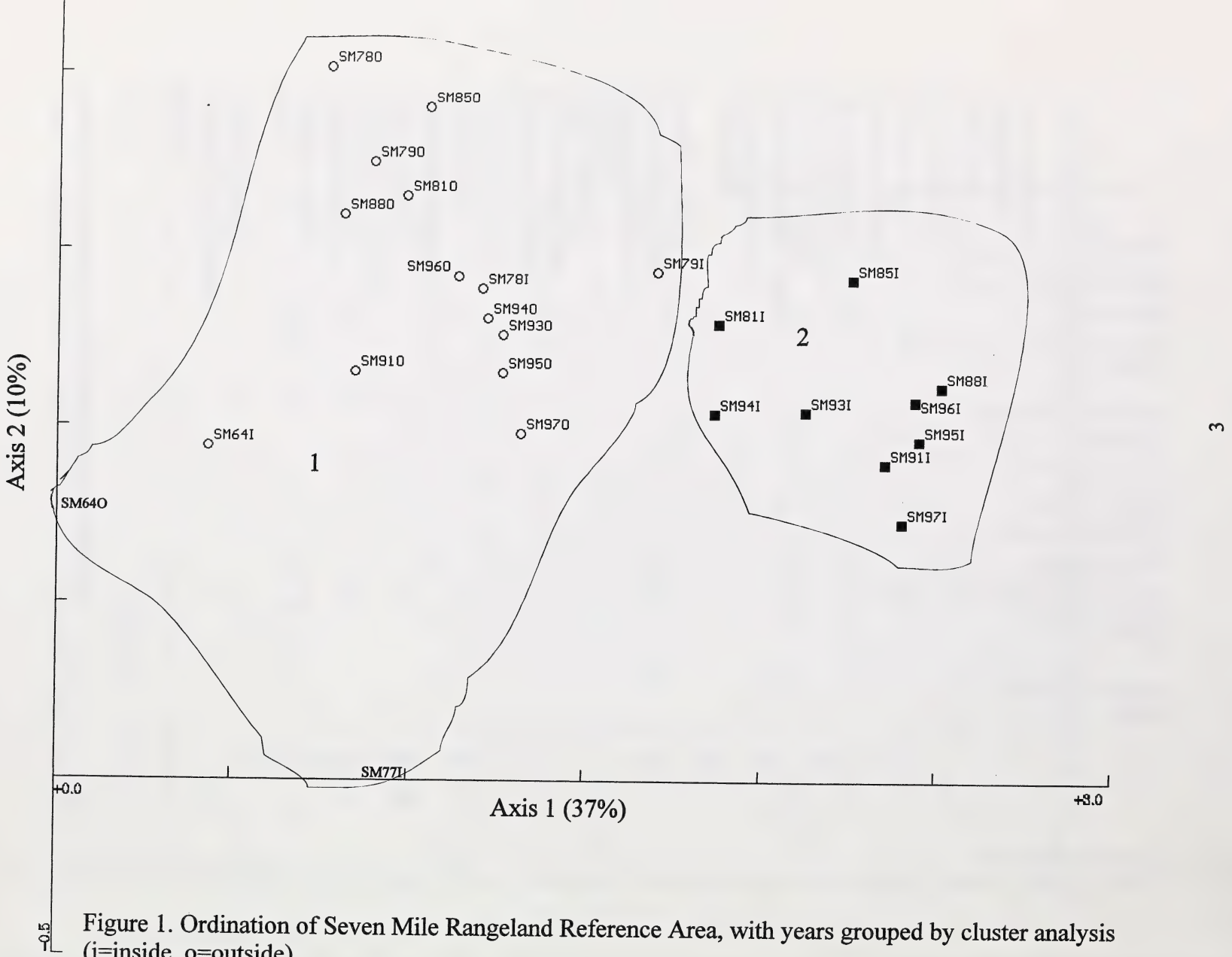

Figure 1. Ordination of Seven Mile Rangeland Reference Area, with years grouped by cluster analysis (i=inside, o=outside).

Table 1. Canopy cover (%) of the dominant species on the inside and outside grouping of transects at the Seven Mile Creek Rangeland Reference area.

Species	Outside (1)	Inside (2)
Shrubs		
MYRTLE LEAVED WILLOW (*Salix myrtillifolia*)	1	18*
Forbs		
COMMON YARROW (*Achillea millefolium*)	10	6
VIENY MEADOW RUE (*Thalictrum venulosum*)	6	18*
TALL LUNGWORT (*Mertensia paniculata*)	1	10*
SMOOTH ASTER (*Aster laevis*)	5	6
DANDELION (*Taraxacum officinale*)	7	4
OLD MAN'S WHISKERS (*Geum triflorum*)	3	3
FIREWEED (*Epilobium angustifolium*)	-	2*
GRACEFUL CINQUEFOIL (*Potentilla gracilis*)	5	2*
Graminoids		
SLENDER WHEATGRASS (*Agropyron trachycaulum*)	9	5
TUFTED HAIRGRASS (*Deschampsia cespitosum*)	15	5*
GRACEFUL SEDGE (*Carex praegracilis*)	7	8
FRINGED BROME (*Bromus ciliatus*)	4	3
KENTUCKY BLUEGRASS (*Poa pratensis*)	6	1*
AWNED SEDGE (*Carex atherodes*)	1	11*

* Indicates a significant difference at the p= 0.05 level according to an Lsmeans test.

Table 2. Change in canopy cover (%) of selected species on the grazed (Out) and ungrazed (In) transects from 1964 to 1995 at Seven Mile Creek exclosure.

	In					Out				
	1964	1979	1988	1993*	1997	1964	1979	1988	1993*	1997
Shrub										
MYRTLE LEAVED WILLOW	4	14	29	2	13	-	-	-	-	-
Forbs										
COMMON YARROW	4	6	1	7	8	3	8	9	22	18
VIENY MEADOW RUE	11	17	24	5	30	-	-	7	13	6
TALL LUNGWORT	-	4	11	17	11	-	-	1	1	2
OLD MAN'S WHISKERS	4	4	7	3	5	-	5	4	1	1
SMOOTH ASTER	4	-	14	2	-	-	-	6	6	-
DANDELION	2	6	4	2	2	-	8	16	9	5
TALL LARKSPUR	-	-	2	8	1	-	-	-	-	-
FIREWEED	-	-	1	3	2	-	-	-	-	-
GRACEFUL CINQUEFOIL	2	5	1	1	-	-	3	14	11	9
Graminoids										
TUFTED HAIRGRASS	24	6	1	9	3	29	17	19	16	13
SEDGE SPP.	2	13	11	16	28	3	T	17	5	7
SLENDER WHEATGRASS	14	15	1	4	4	9	5	3	7	5
KENTUCKY BLUEGRASS	-	14	1	T	1	-	1	1	6	5
FRINGED BROME	2	3	2	4	2	-	2	8	14	6

* Note the Reference area site was burned in May 1993.

transects from 1964 to 1997. Willow, veiny meadow rue, tall lungwort, tall larkspur have all increased and tufted hairgrass has declined in the absence of grazing. Willow cover had also declined rapidly after burning in the spring of 1993, but four years later in 1997 it again had increased to near preburn levels. Burning appears to have had little effect on the cover of the other species at the site. The burned inside transect in 1993 continued to group closely with the inside transects in Group 2 and the burned outside transects in 1993 continued to group closely with the outside transects in Group 1 (Figure 1).

Under grazing pressure willow, tufted hairgrass, Kentucky bluegrass fringed brome and yarrow cover have remained constant or increased (Table 2). It should be noted that the changes in cover of veiny meadow rue and tufted hairgrass on the outside transect are increasing and declining, respectively since 1991 (Appendix 1). This change in species cover are similar to the trend found on the inside transect from 1964 to 1981.

Forage Production

Forage production for the reference area from 1990-1997 is outlined in Table 3. Total forage production averaged over 3500 kg/ha in the presence and absence of grazing for all years combined. Statistically there is a trend for higher production of grass, forb and total production under grazing pressure when all years are combined, but generally there was no statistically significant difference in production on the grazed outside sites compared to ungrazed inside sites when each year is analyzed separately. The highest total production of grass and forbs occurred in 1995 where total production averaged over 4000 kg/ha on both the grazed and ungrazed sites. The lowest production occurred in 1997 when both the grazed and ungrazed sites averaged less than 3000 kg/ha.

DISCUSSION

Species composition

Historically the grazing pressure in the area around the Seven Mile rangeland reference area has been light to moderate (Appendix 2) averaging 67% use of the calculated carrying capacity since 1961. This level of use has maintained the dominance of tufted hairgrass on the outside transect. Willoughby (1992) found that long-term heavy grazing pressure on this community type led to a decline in tufted hairgrass and allowed Kentucky bluegrass, dandelion and clover to increase (Figure 2). Indeed Kentucky bluegrass and dandelion cover have increased on the outside transect from 1964 to 1991, but tufted hairgrass had not declined. It would appear that the grazing pressure at this site has probably been moderate and not light.

Since 1991 the site has been grazed for one week in June and for the month of October. During this time there has been a corresponding drop in the cover of tufted hairgrass, Kentucky bluegrass, dandelion and an increase in cover of veiny meadow rue (Appendix 1). The lack of grazing pressure during the growing season appears to be allowing the outside transect to undergo succession, similar to the ungrazed transect. Hopefully, future data collection will confirm these observations.

Table 3. Forage production (kg/ha) in ungrazed (In) and grazed (Out) sites for the Seven Mile Creek Rangeland Reference Area from 1990 to 1997.

	Grass		Forb		Total	
Year	In	Out	In	Out	In	Out
1990	2840	3420	1640	1360	4480	4780
1991	2840	2500	1080	1480	3920	3980
1992	2420	2400	1020	1380	3440	3780
1993	1880	1220	1500	1760	3360	2980
1994	2180	3380	1580	1900	4340	5260
1995	980	2440*	1840	1240	2820	3680
1996	1840	2120	1160	2220	3260	4060
1997	860	1280	1240	2120*	2500	2960
Average	2080	2220	1360	1740*	3500	3940*

-Means with an asterix are significantly different between In and Out according to an F-test at the 0.05 level.

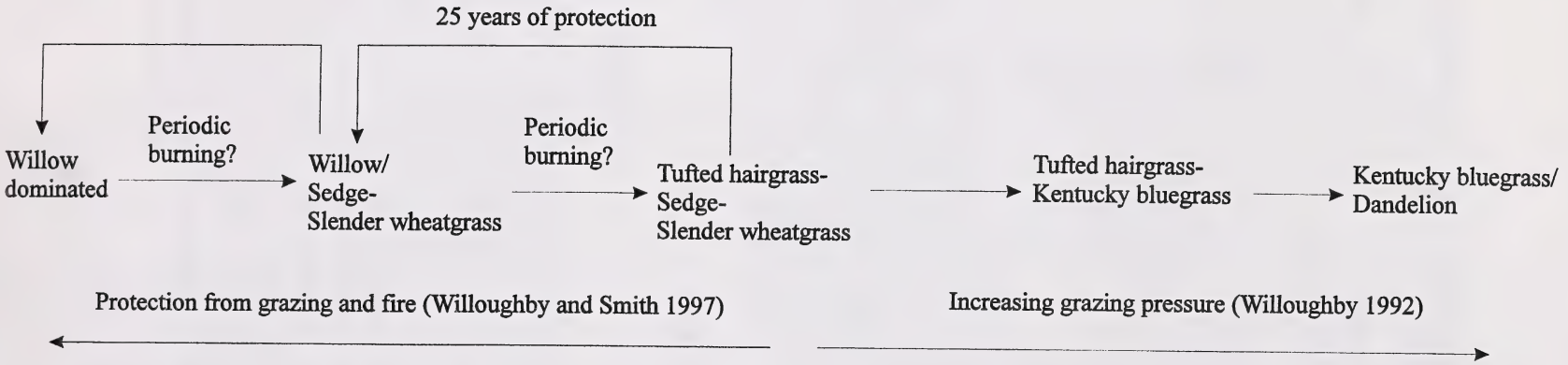
25 years of protection
Willow dominated
Periodic burning?
Willow/ Sedge- Slender wheatgrass
Periodic burning?
Tufted hairgrass- Sedge- Slender wheatgrass
Tufted hairgrass- Kentucky bluegrass
Kentucky bluegrass/ Dandelion
Protection from grazing and fire (Willoughby and Smith 1997)
Increasing grazing pressure (Willoughby 1992)

Figure 2. Successional changes at the Seven Mile Creek Rangeland Reference Area from 1964 to 1997.

The greatest change in species composition has occurred on the ungrazed transect and appears to be caused by increased shrub expansion in response to lack of fire (Figure 2). As the willow cover expands, total grass cover (tufted hairgrass, slender wheatgrass, Kentucky bluegrass, fringed brome) have declined and there had been a corresponding increase in cover of forbs, particularly, veiny meadow rue and tall lungwort. It took over 25 years of no fire and grazing pressure before the species composition had changed significantly from the outside grazed transect (Figure 1). Fire has played a dominant role in controlling brush expansion on these rangelands in the past and continued protection will probably allow the shrub growth to increase, resulting in further decline in forage productivity. The site was burned in 1993 causing willow cover to decline to 2% from a high cover of 33% in 1991. This one burn had no affect on the cover of grasses or forbs inside or outside the exclosure and productivity although higher the year after the burn in 1994, but was still within the normal range of productivity prior to burning from 1990-1992 (Table 3). Since 1993, willow cover had increased to nearly half the cover prior to burning and forage productivity in the absence of grazing continues to be lower than the grazed rangeland. It would appear that periodic burning will be required to control willow expansion and increase forage productivity on these ungrazed sites. In one study, burning a bog birch-willow shrubland three times in 9 years controlled shrub growth and increased forage production by over 40% compared to the unburned control (Bork et al. 1996).

Range condition

Traditionally, range condition has been defined by comparing species present with species of the climax community (Wroe et al. 1988). A large difference in species composition would imply poor range condition. If this concept is applied to the Seven Mile rangeland reference area the condition of the rangeland under grazing pressure would be rated as poor compared to the ungrazed rangeland. Clearly, the ungrazed vegetation at this site has less potential for wildlife and livestock production. The plant community inside the exclosure is slowly succeeding to a unproductive willow/forb dominated community type, whereas, the grazed community continues to be productive and dominated by grass. These current problems with the climax range condition model led the Task Group on Unity and Concepts (1995) to propose that ecological site and desired plant community concepts should be used to assess condition of rangelands. Ecological site is a measure of the successional stage of the site (Joyce 1989). The stages of the successional path would be defined as early seral, mid seral, late seral and potential natural community. The undisturbed inside transect at seven mile is currently in the mid to late seral stages of succession. Willoughby and Smith (1997), found that many of these willow communities in the foothills of Alberta will succeed in the absence of disturbance to a community type that is dominated by willow. There is little forb and grass cover and low forage productivity for wildlife and livestock in this community type.

The desired plant community is the value of the vegetation for a particular use. Clearly, the desired plant community of the vegetation has to be defined before range condition of the site can be determined. If the primary resource of the vegetation is for wildlife and livestock production, then continued grazing by wildlife and domestic livestock is required to maintain the most productive plant community. If there is some other resource that is valued that requires

succession to a willow dominated shrubland then the site should be left undisturbed.

Historically, these shrubland communities in the foothills of West-Central Alberta have been burned and grazed by wild and domestic ungulates. Currently, the primary resource value for these rangelands is recreation, wildlife and livestock production. Periodic burning and grazing by wildlife and livestock will be needed to maintain the resource values that are currently desired by society.

SUMMARY

1.) The inside ungrazed transect at the Seven Mile Rangeland Area is in the mid to late seral stages of succession.

2.) The outside grazed transect of the Seven Mile Rangeland Area has a satisfactory forage rating and has continued to remain stable and productive for wildlife and livestock grazing.

3.) The site should be periodically burned and grazed in the growing season in order to maintain productivity for wildlife and domestic livestock.

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APPENDIX ONE

SPECIES COMPOSITION OF THE INSIDE AND OUTSIDE CLUSTER GROUPS OUTLINED IN FIGURE ONE.

Group name: Group 1 1964-1997 out 64-79 in

					Plots																													
			Avg	Avg	SM64I		SM64O		SM77I		SM78I		SM78O		SM79I		SM79O		SM81O		SM85O		SM88O		SM91O		SM93O		SM94O						
			% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg						
LAYER	N	SPECIES																																
5	1	SALIMYR	37.5	01.8	04				03		03				14								02				01							
	2	POTEFRU	37.5	00.7	03		02						02						01		00		01											
	3	BETUGLA	12.5	00.9	05		09																											
	4	RIBELAC	06.3	00.1											02																			
6	5	ACHIMIL	0100	10.4	03		02		08		03		05		05		08		15		01		09		12		21		16					
	6	THALVEN	0100	06.7	03		04		05		03		02		07		04		12		00		07		05		13		15					
	7	GEUMTRI	0100	03.2	03				04		06		05		04		04		08		03		04		02		01		01					
	8	TARAOFF	93.8	07.2	02				05		05		04		05		07		14		04		16		10		08		09					
	9	POTEGRA	81.3	05.6	02						02				05		03		12		03		14		04		11		07					
	10	FRAGVIR	81.3	05.6	03		03						07				06		18		06		26		03		02		03					
	11	VICIAME	81.3	03.6	02				04		02				02				05		00		01		01		16		11					
	12	GALIBOR	75.0	01.8	03		02										02		01		01		02		01		03		01					
	13	CERAARV	75.0	00.9							02		02		04		02		00		00		00		00				00					
	14	ASTELAE	62.5	04.9	03						05		10						18		10		06		02		06		06					
	15	ZIZIAPT	62.5	00.8													02		03		00		00		00		01		03					
	16	GEUMALE	62.5	00.6									02				02		00		00		01				00		00					
	17	MERTPAN	56.3	00.8											04				00				00		01		00		01					
	18	CAMPROT	37.5	00.5							02		02										00				00		01					
	19	SMILSTE	31.3	00.3							02				02						00		00		00									
	20	RUMEACE	25.0	00.4							02												00						02					
	21	ASTRALP	25.0	00.3																	00		04		00									
	22	ARNIFUL	18.8	00.3																							01							
	23	AGOSGLA	18.8	00.2							02												00				00							
	24	ASTECIL	12.5	00.9																														
	25	TRIFREP	12.5	00.3									03				02																	
	26	RANUCAR	12.5	00.3							02												01											
	27	POLYVIV	06.3	00.2							03																							
	28	ERIGPER	06.3	00.2									03																					
	29	POTECON	06.3	00.2									03																					
	30	VIOLCAN	06.3	00.2									03																					
	31	LATHOCH	06.3	00.2			02																											
	32	POTEDIV	06.3	00.2																														
	33	ARCTUVA	06.3	00.2			02																											
	34	ANTELAN	06.3	00.1																									01					
	35	GENTAMA	06.3	00.1																			01											
	36	POTEARG	06.3	00.0																					00									
	37	ARNICHA	06.3	00.0																														
	38	RUMECRI	06.3	00.0																							00							
	39	SENECAN	06.3	00.0																					00									
	40	VALEDIO	06.3	00.0																					00									

(CONTINUED)

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group 1 1964-1997 out 64-79 in

				Plots																															
			Avg	Avg	SM64I		SM64O		SM77I		SM78I		SM78O		SM79I		SM79O		SM81O		SM85O		SM88O		SM91O		SM93O		SM94O							
			% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg							
LAYER	N	SPECIES																																	
6	41	VALESIT	06.3	00.0																															
	42	SOLIMIS	06.3	00.0																	00														
7	43	AGROTRA	0113	09.0	13		09		04		14		11		15		10		04		02		03		14		06		14						
	44	DESCCES	0100	15.5	24		28		13		09		09		06		09		16		01		19		39		16		13						
	45	BROMCIL	93.8	04.7	02						06		05		06		02		03		01		08		02		13		09						
	46	CAREPRE	87.5	07.0	02		02		06		08		10				12		00		01		17		11				07						
	47	POA PRA	81.3	05.7							06		11		13		15		00		00		01		10		06		08						
	48	JUNCBAL	81.3	00.9					02		02		02				02		01		00		00		00		00		00						
	49	FESTSCA	62.5	01.4	02				04				04						03		01		03		02		00		00						
	50	FESTBRA	37.5	02.4	17		14		02														02						01						
	51	CAREATH	25.0	01.2											12										00		05		00						
	52	KOELMAC	25.0	01.1							08						04		01				03												
	53	HIERODO	25.0	00.1																					00		00								
	54	ELYMINN	18.8	01.1					05														06												
	55	CALACAN	06.3	00.8					13																										
	56	AGROELY	06.3	00.3																															
	57	PHLEPRA	06.3	00.2							02																								
	58	FESTSAX	06.3	00.1																															
	59	CAREATR	06.3	00.1																															
	60	POA COM	06.3	00.0																															

(CONTINUED)

Group name: Group 1 1964-1997 out 64-79 in

			Plots					
			SM950		SM960		SM970	
LAYER	N	SPECIES	Cv	Vg	Cv	Vg	Cv	Vg
5	1	SALIMYR						
	2	POTEFRU						
	3	BETUGLA						
	4	RIBELAC						
6	5	ACHIMIL	16		17		18	
	6	THALVEN	08		08		06	
	7	GEUMTRI	01		00		00	
	8	TARAOFF	06		07		05	
	9	POTEGRA	06		05		09	
	10	FRAGVIR	03		01		03	
	11	VICIAME	03		03		02	
	12	GALIBOR	01		05		02	
	13	CERAARV	00		00		00	
	14	ASTELAE			07			
	15	ZIZIAPT	00		00		00	
	16	GEUMALE	00		00		01	
	17	MERTPAN	01		00		02	
	18	CAMPROT			00			
	19	SMILSTE						
	20	RUMEACE					01	
	21	ASTRALP					00	
	22	ARNIFUL			01		01	
	23	AGOSGLA						
	24	ASTECIL	07				06	
	25	TRIFREP						
	26	RANUCAR						
	27	POLYVIV						
	28	ERIGPER						
	29	POTECON						
	30	VIOLCAN						
	31	LATHOCH						
	32	POTEDIV			02			
	33	ARCTUVA						
	34	ANTELAN						
	35	GENTAMA						
	36	POTEARG						
	37	ARNICHA	00					
	38	RUMECRI						
	39	SENECAN						
	40	VALEDIO						

(CONTINUED)

VEGETATION REPORT

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group 1 1964-1997 out 64-79 in

			Plots					
			SM95O		SM96O		SM97O	
LAYER	N	SPECIES	Cv	Vg	Cv	Vg	Cv	Vg
6	41	VALESIT					00	
	42	SOLIMIS						
7	43	AGROTRA	05		09		04	
	44	DESCCES	12		15		12	
	45	BROMCIL	05		04		03	
	46	CAREPRE	07		07		16	
	47	POA PRA	04		08		05	
	48	JUNCBAL	00		00		00	
	49	FESTSCA	00					
	50	FESTBRA			00			
	51	CAREATH						
	52	KOELMAC						
	53	HIERODO			01		00	
	54	ELYMINN					06	
	55	CALACAN						
	56	AGROELY	04					
	57	PHLEPRA						
	58	FESTSAX					01	
	59	CAREATR						
	60	POA COM					00	

Group name: Group 2 1981-1997 in

					Plots																					
			Avg	Avg	SM81I		SM85I		SM88I		SM91I		SM93I		SM94I		SM95I		SM96I		SM97I					
			% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg				
LAYER	N	SPECIES																								
5	1	SALIMYR	0100	18.6	28		12		29		33		01		11		16		21		13					
	2	RIBELAC	44.4	00.5							01						00		00		01					
	3	POTEFRU	33.3	00.1							00		00				00									
	4	RIBETRI	11.1	00.0															00							
6	5	TARAOFF	0111	04.8	14		03		04		02		06		06		01		01		02					
	6	THALVEN	0100	17.9	17		11		24		10		17		14		14		21		30					
	7	MERTPAN	0100	10.6	15		05		11		08		10		08		08		15		11					
	8	ACHIMIL	0100	06.6	13		01		01		03		06		09		03		11		08					
	9	DELPGLA	0100	03.7	04		00		02		06		08		08		00		01		00					
	10	VICIAME	0100	03.1	05		00				00		03		05		03		02		05					
	11	GALIBOR	0100	02.5	03		02		01		02		02		02		02		03		03					
	12	GEUMTRI	88.9	03.5	04				07		04		03		04		00		01		05					
	13	EPILANG	88.9	02.2			00		00		08		03		02		02		01		02					
	14	POTEGRA	88.9	01.4	06		00		00		01		00		01		01		00							
	15	ASTELAE	77.8	06.1	18		10		14		01		00		03				05							
	16	RUMEACE	77.8	00.6	00		00		00		02		01						01		00					
	17	GEUMALE	66.7	00.5	00		01				00		00		00		00									
	18	ZIZIAPT	66.7	00.4	01								00		01		00		00		00					
	19	CAMPROT	66.7	00.3							00		00		00		00		00		00					
	20	FRAGVIR	55.6	00.3	01		00		00		00		00													
	21	SMILSTE	55.6	00.3					00		01		00						00		00					
	22	VALEDIO	44.4	00.4	00						00				02		00									
	23	ARNICHA	44.4	00.3					00		00		00				01									
	24	STELLON	44.4	00.2							01						00		00		00					
	25	CERAARV	44.4	00.2			00								01		00		00							
	26	ASTECIL	22.2	00.9													03				05					
	27	ARNIFUL	22.2	00.2															01		00					
	28	SOLIMIS	22.2	00.2			00														01					
	29	POTEDIV	22.2	00.2															01		00					
	30	AGOSGLA	22.2	00.0															00		00					
	31	ANTELAN	11.1	00.3											02											
	32	ACTARUB	11.1	00.1											01											
	33	COLLLIN	11.1	00.1													00									
	34	GEUMMAC	11.1	00.1															00							
	35	VALESIT	11.1	00.0															00							
	36	GERARIC	11.1	00.0																	00					
	37	VIOLADU	11.1	00.0															00							
7	38	CAREATH	0100	11.6	02		06		17		11		06		09		20		18		12					
	39	DESCCES	0100	05.6	11		02		01		06		08		14		03		01		01					
	40	AGROTRA	0100	05.3	06		01		00		14		03		11		03		04		01					

(CONTINUED)

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Group 2 1981-1997 in

			Plots																					
	Avg	Avg	SM81I		SM85I		SM88I		SM91I		SM93I		SM94I		SM95I		SM96I		SM97I	
	% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER N SPECIES																								
7 41 BROMCIL	0100	03.3	05		03		02		00		04		06		01		03		01			
42 JUNCBAL	88.9	01.3	01		00		01		02		00				00		01		01			
43 POA PRA	77.8	00.9	02				00				00		02		00		01		00			
44 CAREPRE	66.7	08.2							19		08		13		07		12		12			
45 HIERODO	55.6	00.4							01		00		01				01		00			
46 FESTSCA	33.3	00.1							00						00		00					
47 AGROELY	22.2	01.3									10				02							
48 ELYMINN	22.2	01.2					06												04			
49 CAREAQU	22.2	00.3									00						02					
50 FESTBRA	22.2	00.1					00						00									
51 CAREPRA	11.1	00.4																	03			
52 BROMPUM	11.1	00.2							01													

Appendix 2. Range use in the Clearwater Allotment-Seven Mile distribution unit (D.U.).

Year	AUMs	Percentage Use(%)	Season of Use
1961	273	48	June 5-July 5 / Oct. 7-Oct. 25
1962	110	19	June 1- July 1 / Oct. 15 - Oct. 31
1963	316	56	June 6-July 10 / Oct. 15-Oct. 31
1964	439	77	May 31- July 30 / Oct. 20 - Oct. 31
1965	453	80	June 2-Aug. 7 /Oct. 25-Nov. 1
1966	348	62	June 1 - Juyly 4 / Sept. 27-Oct. 23
1967	335	60	June 19-July 14 / Oct. 15 - Oct. 31
1968	434	77	June 15-July 16 / Oct. 11-Oct. 31
1969	451	80	June 18-July 19 / Oct. 13-Oct.31
1970	476	85	June 13-July 7 / Oct. 1 - Nov. 2
1971	362	64	June 14-July 10 / Oct. 1-Oct. 15
1972	495	88	June 15- July 15 / Sept. 23 - Oct. 30
1973	387	69	June 16 - July 18 / Oct. 8-Oct. 30
1974	397	71	June 18-July 15 / Oct. 5-Oct. 31
1975	335	58	June 16-July 7 / Oct. 1- Nov. 1
1976	418	74	June 21 - July 20 / Oct. 1-Oct. 31
1977	266	47	June 14-July 16
1978	293	52	June 18-July 21 / Sept. 27-Nov. 2
1979	352	62	June 14-July 14 / Oct. 15-Nov. 2
1980	404	72	June 14 -July 8 / Oct. 16-Nov. 2
1981	231	41	June 14-July 1 / Oct. 23-Oct. 31
1982	307	54	June 18-July 2 / Oct. 15-Oct. 30
1983	311	55	June 16-July 1 / Oct. 18-Oct. 31
1984	267	47	June 23-July 1 / Oct. 15-Oct. 31
1985	484	86	June 15-July 9 /Oct. 14-Oct. 31
1986	366	65	June 13-July 3 / Oct. 23-Oct. 31
1987	400	71	June 14-June 30 / Oct. 16-Oct. 30
1988	341	61	June 13-July 1 / Oct. 16-Oct. 30
1989	450	80	June 15-July 1/Oct. 15-Oct. 31
1990	560	100	June 15-July 3 / Oct. 3- Oct. 30
1991	128	23	Oct. 15-Oct. 31
1992	395	70	Oct. 1-Oct. 31
1993	414	74	June 15- July 1 / Oct. 20 -Oct. 31
1994	407	73	Oct. 1-Oct. 31
1995	529	93	June 15-June 24, Oct 3-Oct 31
1996	541	96	June 15-June 24, Oct 2-Oct 31
1997	540	96	June 15-June 24, Oct 1-Oct 31

Average	67

1989 - Carrying capacity for the Seven Mile D.U. was set at 563 AUMs.
Note - Percentage use of carrying capacity is determined by dividing actual use by calculated carrying capacity

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